

TENKO 23+

VOLTAGE CHART

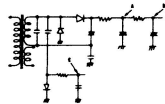
- All readings taken with VTVM from chassis (negative) to point indicated.
- Input to transceiver set at 220 volts AC. Similar readings are obtained with 12.6 volts DC input.
- Transceiver set to channel 13.
- PA switch in CB position, VOLUME and SQUELCH at minimum (counter clockwise), FINE TUNING in crystal (normal) position.
- 50 ohm dummy load connected to antenna connector.
- Readings on individual units may vary by as much as $\pm 20\%$.

NDV No detectable voltage; NC No connection; NM Not measurable.

TUBE VOLTAGES

TUBE	MODE	1	2	3	4	5	6	7	8	9
6BE6 V1	TR	100	NDV	90	H	H	240	9.8	3.5	NDV
6BE6 V2	TR	30	NDV	125	H	H	115	2.3	0	-5.4
6BA6 V3	TR	NDV	0	H	H	276	76	9.9		
6BA6 V4	TR	NDV	0	H	H	239	-55	9.9		
12AX7 V5	TR	90	NDV	90	H	H	90	NDV	0.7	NC
6BD6 V6	TR	90	NDV	90	H	H	85	NDV	0.65	NC
6BD6 V7	TR	NC	NDV	47	H	H	NC	250	NC	200
6BD6 V8	TR	NC	NDV	53	H	H	NC	270	NC	215
6BD6 V9	TR	65	-0.34	65	H	H	100	0.06	0	-4.54
6BD6 V10	TR	70	-0.34	70	H	H	115	0.06	0	-5.04
6BD6 V11	TR	100	-0.44	110	H	H	180	2.0	0	-1.74
6BA6 V12	TR	NDV	0	H	H	230	80	1.8		
6BD6 V13	TR	NC	-15.4	20	H	H	NC	5.4	NC	223
12AX7 V14	TR	100	NDV	0	H	H	100	NDV	0	
6BD6 V15	TR	110	NDV	0	H	H	110	NDV	0	

a Measured with 1 megohm resistor in series with DC probe. Reading may vary at grid pins, depending on crystal activity.



Point	TR	REC
A	255 V	269 V
B	197 V	218 V
C	-94 V	-117 V

MODULATION ADJUSTMENT

Connect a modulation monitor to the transceiver. Connect the shield lead of an audio generator to a ground point on the transceiver. Connect the "hot" center lead of the generator in series with a .05 mfd condenser to pin 1 of the microphone jack. Set generator frequency to 1 KHz and adjust same to 40 mv. output. Adjust VR4 to produce 80% modulation. To check the adjustment of VR4, adjust the generator output (5mv) so that the modulation monitor indicates 50%.

NOTE: Following the above steps will produce 100% modulation on speech. In no case shall modulation exceed 100%.

CRYSTAL FREQUENCY CHART

The following chart indicates which two crystal frequencies are used for each of the 23 channels.

Channel	Crystal 1 (MHz)	Crystal 2 (MHz)
1	23,260	23,340
2	23,360	23,440
3	23,440	23,520
4	23,520	23,600
5	23,600	23,680
6	23,680	23,760
7	23,760	23,840
8	23,840	23,920
9	23,920	24,000
10	24,000	24,080
11	24,080	24,160
12	24,160	24,240
13	24,240	24,320
14	24,320	24,400
15	24,400	24,480
16	24,480	24,560
17	24,560	24,640
18	24,640	24,720
19	24,720	24,800
20	24,800	24,880
21	24,880	24,960
22	24,960	25,040
23	25,040	25,120

TV INTERFERENCE TRAP

This transceiver contains a built-in adjustable network in series with the antenna. When tuned correctly, it suppresses television interference. This network is a filter which offers little opposition to the transmitter frequency but will help eliminate the second harmonic radiation.

Turn on a TV receiver that you can see from your transmitting location, and tune to one of the three lower TV channels that has a station operating in your vicinity. If you notice a "cross-hatch" or "wavy line" pattern on the screen while you are transmitting, it will be necessary to adjust the RF network coil slug screw (L1) in rear of cabinet, to eliminate or minimize this interference. This will usually only be necessary when the transmitter antenna is located near the TV antenna, or that of a neighbor.

LOCAL OSCILLATOR

The master local oscillator, V7B, is crystal-controlled and is used during both transmit and receive. A normally functioning oscillator will develop approximately 4.5 volts at pin 9 of V7B (see voltage charge). Differences in individual crystal activity will cause a variation in the voltage measured at this point.

A local oscillator is tuned as follows: adjust the bottom core of L7 for maximum negative reading at pin 9 of V7B with the channel selector switch set to channel 23, then back off from peak in a clockwise direction to about 20% of the maximum reading. Check all channels for activity. A defective crystal will produce zero voltage at pin 9 in four consecutive channels.

After this adjustment has been made, check transmitter output frequency to make sure it is within FCC specification on all channels. Readjust L7 if necessary.

SYNTHESIZER, 2nd LOCAL OSCILLATOR

The synthesizer (V11B) is used during both transmit and receive. A normally functioning oscillator will develop approximately 0.3 volts at V7A pin 2 (see voltage chart), depending upon crystal activity. The output from V7A and the output from V7B produce a 38 MHz output to the plate circuit of V11B, 19 being tuned to this frequency.

RF ADJUSTMENTS

When it has been ascertained that all oscillators are functioning properly, connect the signal generator (modulated 30% at 1 KHz) to the antenna connector. Use the RDSR U or equivalent 50 ohm cable. Set generator output to approximately 10 μ V, and switch receiver to channel 13. Tune the generator around 11.275 MHz until a signal is heard in the receiver. Adjust the generator output frequency for maximum output voltage reading on the VTVM (at speaker terminals). Adjust the top and bottom tuning cores of L1 for maximum output.

"S" METER ADJUSTMENT

After receiver alignment has been completed, adjust VR1 for a "S-9" reading on the "S" meter with 100 μ V at the antenna input and transceiver set to channel 13.

TRANSMITTER ALIGNMENT

The detailed operation and alignment of the local oscillator and synthesizer has been covered previously. 90° oscillators are used for the transmit operation.

In the receive mode B- is removed from V8 and V9 and a large bias is applied to the grid of the RF power output tube V10. In the transmit mode, B- is removed from V1, V2, V3 and V4 in the receiver and applied to V8 and V9 in the transmitter. The bias formerly applied to V10 is removed.

NOTE: Connect a 50 OHM dummy load to antenna connector before proceeding (use two 100 ohm 2 watt resistors in parallel).

Connect VTVM (with series resistor) to pin 2 of V10. Adjust L5 for maximum reading on channel 13. A reading of approximately 15 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slightly re-adjust L5 for equal reading on all channels.

Connect VTVM (with series resistor) to pin 2 of V10. Adjust L5 for maximum reading on channel 13. A reading of approximately 15 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slightly re-adjust L5 for equal reading on all channels.

MAXIMUM RF OUTPUT

CV5 (Load) and CV4 (Plate) should now be adjusted for maximum power output on the RF wattmeter. Adjustment of CV4 and CV5 affects the power input to the final amplifier. Remember, maximum RF input power has been set at 5 watts by the FCC. Power input may be determined as follows: Check the voltage across resistor R79 (1K, 2W). It should not exceed 19 volts. This figure has been arrived at on the basis of an average of 223 volts on the plate with 19 mA plate current. $223 \times 0.019 = 4.24$ watts.

If the voltage measured across R79 is higher than 19 volts, set CV5 fully clockwise and then peak CV4 for maximum. Now adjust CV5 clockwise until reading of 19 volts is measured across R79.

RECEIVER ALIGNMENT

455 KHz IF ADJUSTMENT

Connect the transceiver to a power source and attach the microphone. Turn volume to its mid-position squelch at minimum and the PA switch in the CB position. Set FINE TUNING to the mid-position (normal) and the CHANNEL selector to channel 13.

Connect an AC voltmeter (VTVM) across the speaker terminals in the transceiver. Alternatively, the meter can be connected to the "Phone" jack by means of a standard phone plug.

Connect a 455 KHz signal generator (modulated 30% at 1 KHz) to pin 8 of V2 (6BL8). Make certain the output frequency of the generator is within 1 KHz of 455 KHz. Increase generator output until the VTVM reads approximately 0.5 volts.

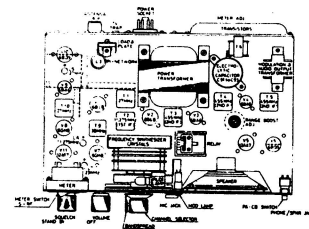
Adjust the top and bottom tuning cores of T3, T4 and T5 for maximum output. Reduce generator output progressively as circuits come into line so that VTVM reading does not exceed about 0.5 volts. When no further increase can be obtained by adjusting the cores, disconnect the signal generator and proceed with the 11.275 MHz IF adjustments.

11.275 MHz IF ADJUSTMENT

Connect the signal generator to pin 9 of V1 (6BL8), with the VTVM connected to the speaker terminals. Make sure the Fine Tuning control is in the normal, center position. Tune the generator in the vicinity of 11.275 MHz until a maximum reading is obtained on the VTVM. Reduce generator output level until the meter reads about 0.5 volts. Adjust top and bottom cores of T2 for maximum reading, reducing generator output if necessary so that reading does not exceed 0.5 volts.

SECOND OSCILLATOR

The second oscillator V2B (6BL8) is crystal-controlled. The Fine Tuning control permits fine tuning of the receiver and has a total range of about 2.5 KHz. A normally functioning oscillator will develop approximately -1.5 to -8 volts at pin 9 of V2B. Differences in individual crystal activity will cause a variation in grid voltage for crystal to crystal.



SIMPLE TROUBLE SHOOTING

TUBES

Tubes may be checked in a do-it-yourself tube tester in a neighborhood store, or may be taken to a service shop for testing. Replace any weak or defective tubes with new ones of identical type. Before replacing tubes in the transceiver, refer to the diagram (on a following page) which shows the correct tube location.

SOLID-STATE DC POWER SUPPLY

This transceiver employs a solid-state (2-transistor) power supply circuit during 12 volts DC operation (no vibrator is used). The transistors, which are located on the rear panel, have been treated with a light protective coating to avoid possible oxidation. Under no circumstances should the transistors be allowed to come into contact with the vehicle chassis, metal brackets, etc. This will cause a short-circuit and may destroy the transistors.

PILOT LAMPS

There are two pilot lamps used in the transceiver. One of these is built into the meter, and the other provides illumination for the channel dial plate. Both are run considerably below their maximum rating and should therefore last almost indefinitely.

FUSES

The 12-volt DC power cable uses an "in-line" fuse. The value of this fuse is 8 amp. Provision has also been made for fusing the primary circuit during 117 volt AC operation by means of a 2 amp fuse located within the transceiver (remove bottom cover for access to the fuse).

In the event of complete failure (tube filaments and pilot lamps not lighting), the fuse should always be checked first. If it has failed, replace only with one of a similar rating. Repeated failure of a fuse would indicate a serious fault in the transceiver which should be investigated.

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